Panel #4
Remedy Effectiveness: Comparison of Remediation Technologies

Thin Layer Dredging and Capping

Recent Case Histories

William Elmer, PE, Foster Wheeler Environmental Corp
John Lally, Foster Wheeler Environmental Corp


8 17'00

Puget Sound Naval Shipyard CERCLA Cleanup

Ward Cove Sediment Remediation

Overview: New Bedford Harbor Pre-Design Field Test (PDFT)

- PDFT Performed in August of 2000
  - Removed 2,300 cy Over 5 Days
- PCB Concentrations up to 2,600 ppm
- To Prepare for Full Scale Remediation to Remove >600,000 cy from NBH
- Research Performance of New Technology to Meet Specific Criteria

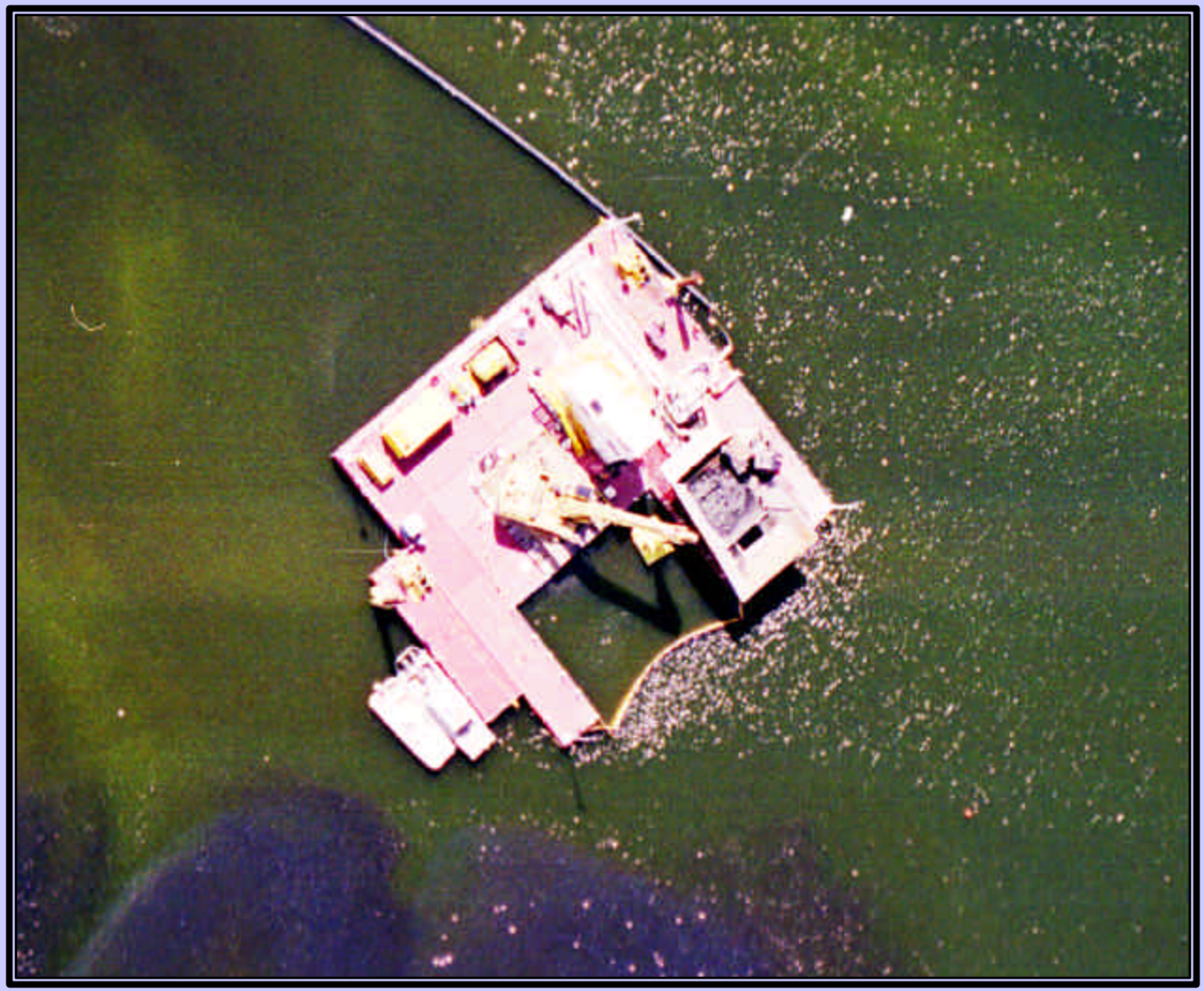
Dredge Performance Evaluation Criteria

- Reasonable and Consistent Production Rates Especially when Encountering Debris
- High Degree of Vertical Precision (+/- 6 inches)
- Maximize Solids Content, Minimize Water Volumes Requiring Management & Treatment
- Minimize or Eliminate Sediment Resuspension
- High Degree of Positioning Accuracy
- Ability to Operate in Shallow Water (1-4 ft)
- Control Odors and PCB Volatization

Selection Process

- Initial Plan (ROD) to Hydraulically Dredge
- Evaluated Several Alternative Systems (1999)
- Developed Concept of a Specialized Hybrid Dredge
  - Mechanical Excavator/Hydraulic Transport
  - Mounted on Modular Float System
  - Manufactured Off Site, Assembled on Site
- Bean Environmental LLC (BELLC) Fabricated and Operated Specialized Hybrid System

BELLC Test Dredge

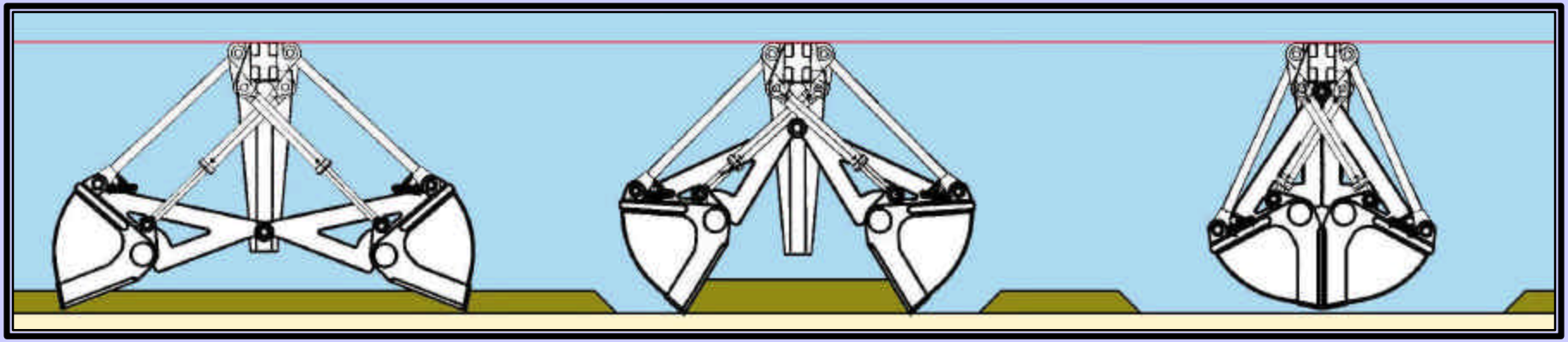


BELLC Test Dredge

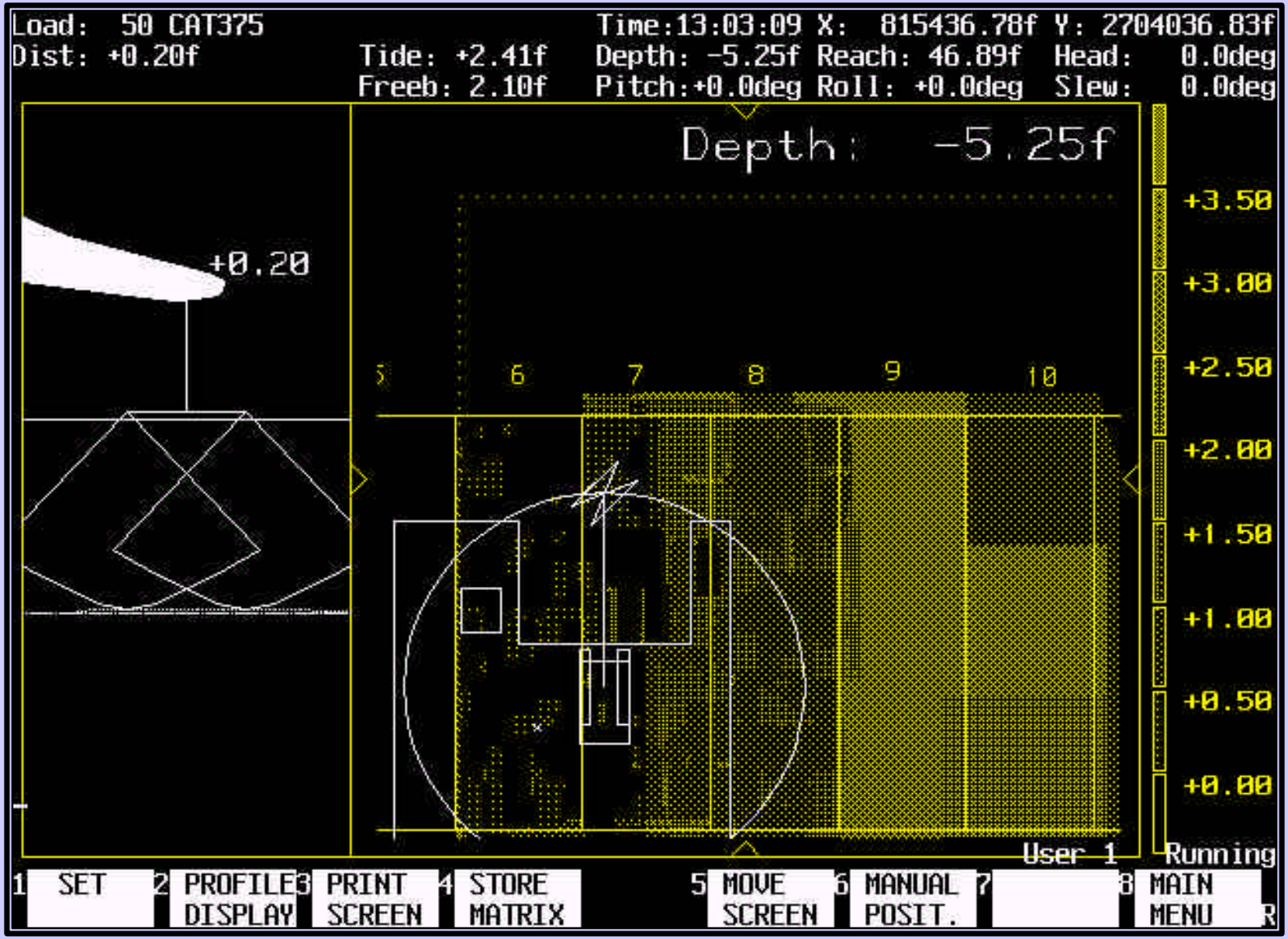
BELLC Test Dredge

Horizontal Profiling Grab Bucket

- 4.5 cy Bucket
- Full Range of Motion
- Hydraulic Closure
- Sealed Edges
- Level Cut



Crane Monitoring System (CMS)



Dump into Hopper/Grizzly

Water Injection at Patented Slurry Processing Unit

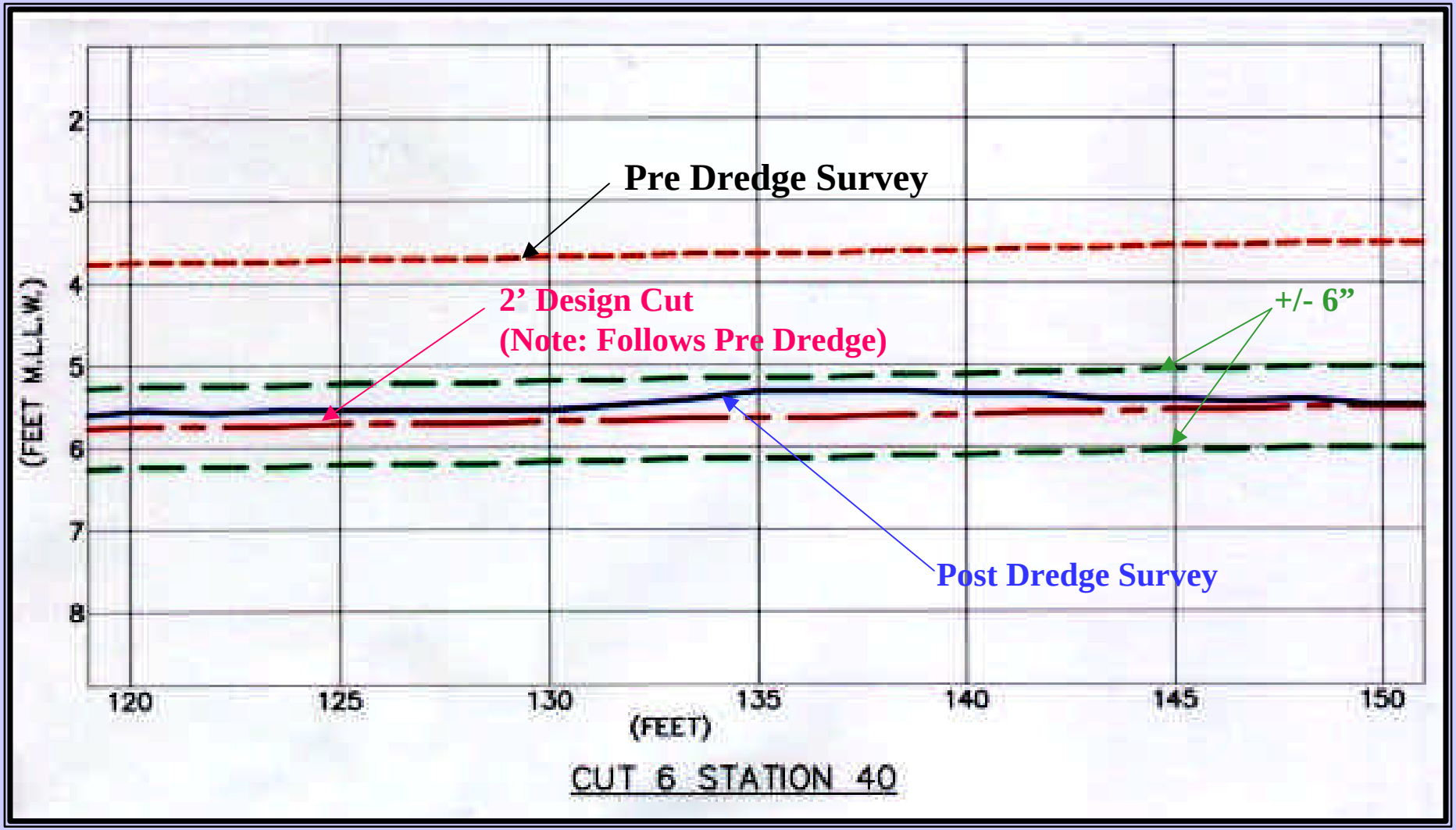
Pipeline Slurry Discharge to CDF

Re-Circulation System

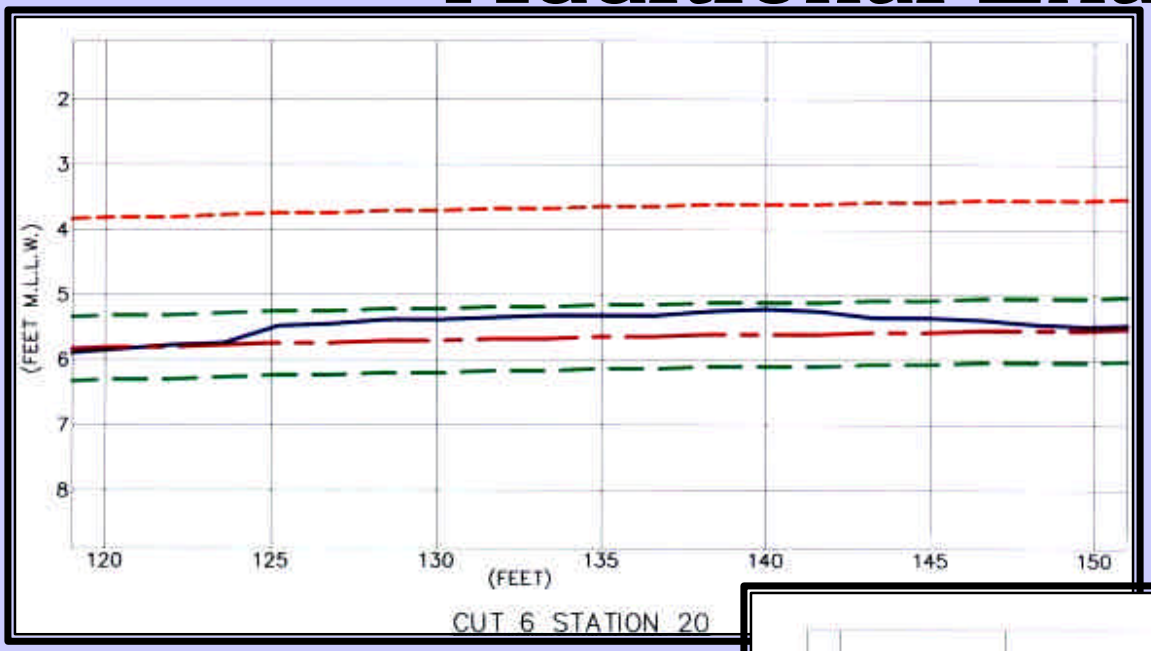
Summary of Success

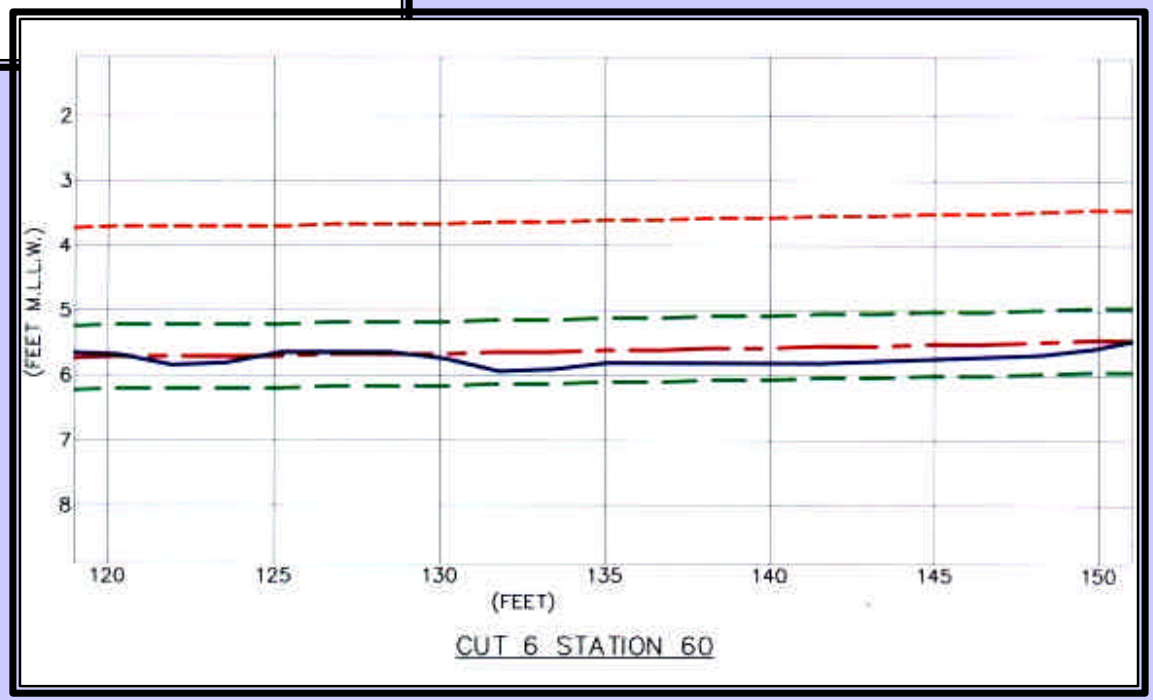
- Precise Elevation Control (Better than +/- 6”)
- No Make Up Water Required
- Handled Debris Satisfactorily - Further Development Needed
- Met Resuspension Expectations During Dredging
- Reached Desired Production Rate (100 cy/hr)
- 97% of PCB Mass Removed from Test Area

Profiles


Pre Dredge Survey
2' Design Cut
(Note: Follows Pre Dredge)
+/- 6"
Post Dredge Survey
(FEET M.L.L.W.)
2
3
4
5
6
7
8
120
125
130
135
140
145
150
(FEET)
CUT 6 STATION 40

Additional Examples





Lessons Learned

- Expect Start up Delays w/ Special System
- Have Good Plan in Place for Debris Management
- Size SPU Throughput to Exceed Excavator Input
- Understand Post Dredge Sampling Results
  - Purpose to Evaluate a New Alternative
  - Cleanup Secondary
- Nevertheless Able to Conclude This Was a Very Efficient System Which Can Meet Clean Up Goals

Puget Sound Naval Shipyard CERCLA Cleanup

Overview of the Project

Dredge Volumes:

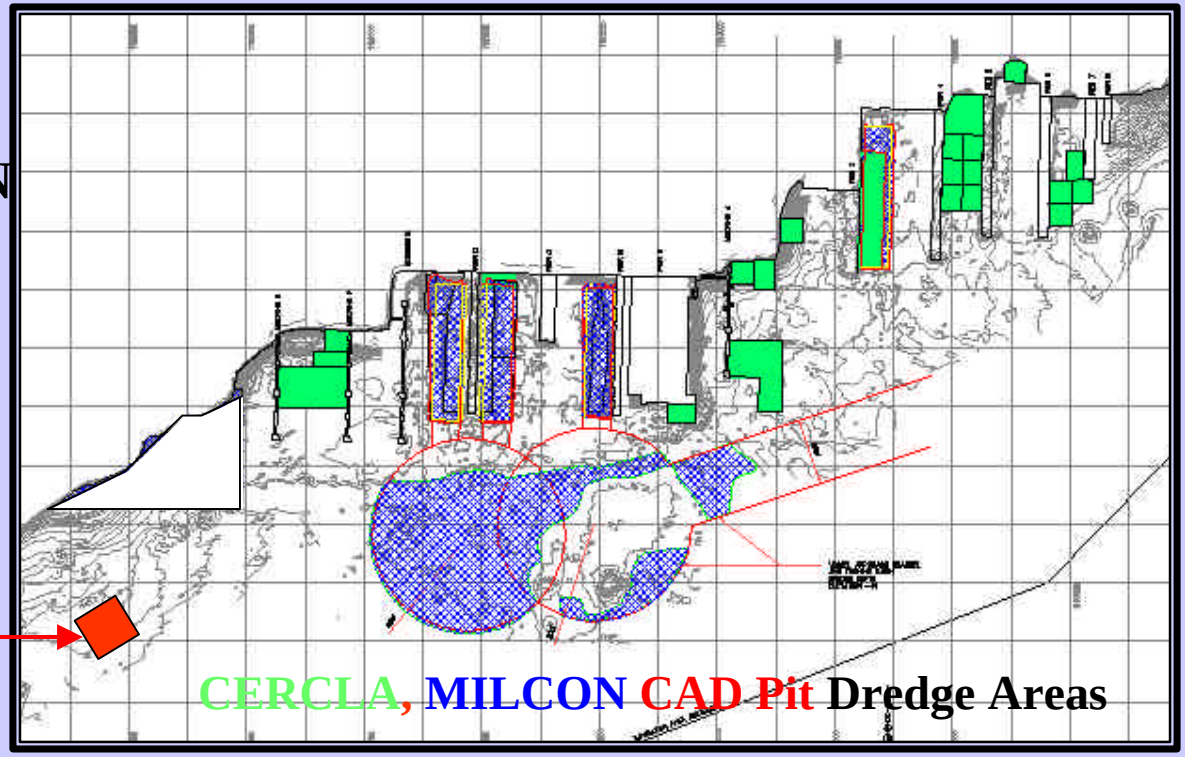
PCB >12 mg/Kg OC normalized or PCB >6 mg/Kg OC & >3 mg/Kg Hg

223,000 cy CERCLA

171,000 cy Unsuitable MCON

Total 394,000 cy Contam-inated/Unsuitable

All Placed in On Site Subacqueous Pit CAD



CERCLA, MILCON CAD Pit Dredge Areas

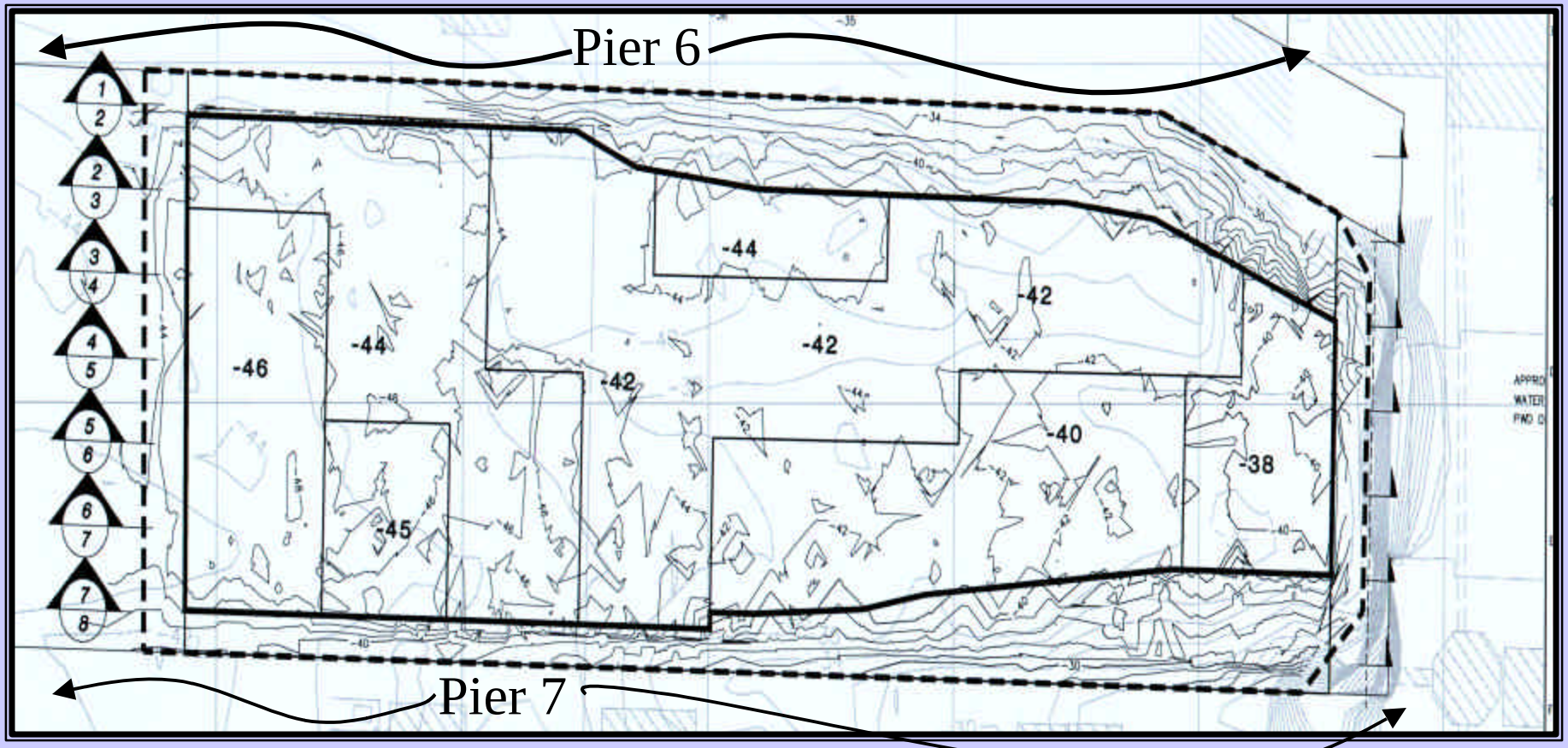
Unique Because:

- Volume of Contaminated Material was Significant (>390,000 cy)
- Tight Schedule
- Limited Berth Availability
- Significant Daily Tidal Exchange
- Use of Large Equipment
- 35’ to 50’+ Water Depths
- Required Precision Dredging (CAD Pit Volume Constraint)

Awareness!

- At Start Up Worked as if the Project was a Production Project
  - Excessively Rapid Bucket Retrieval
  - Dragging Bucket Horizontally in Water
  - Swinging Bucket While Opening
- Use of “Familiar” Vertical Bucket Control System in Rapidly Changing Tidal Conditions Potential for Under/Over Dredging
  - Old Attitudes and Methods Die Hard

Complex Dredge Plan/Tight Quarters

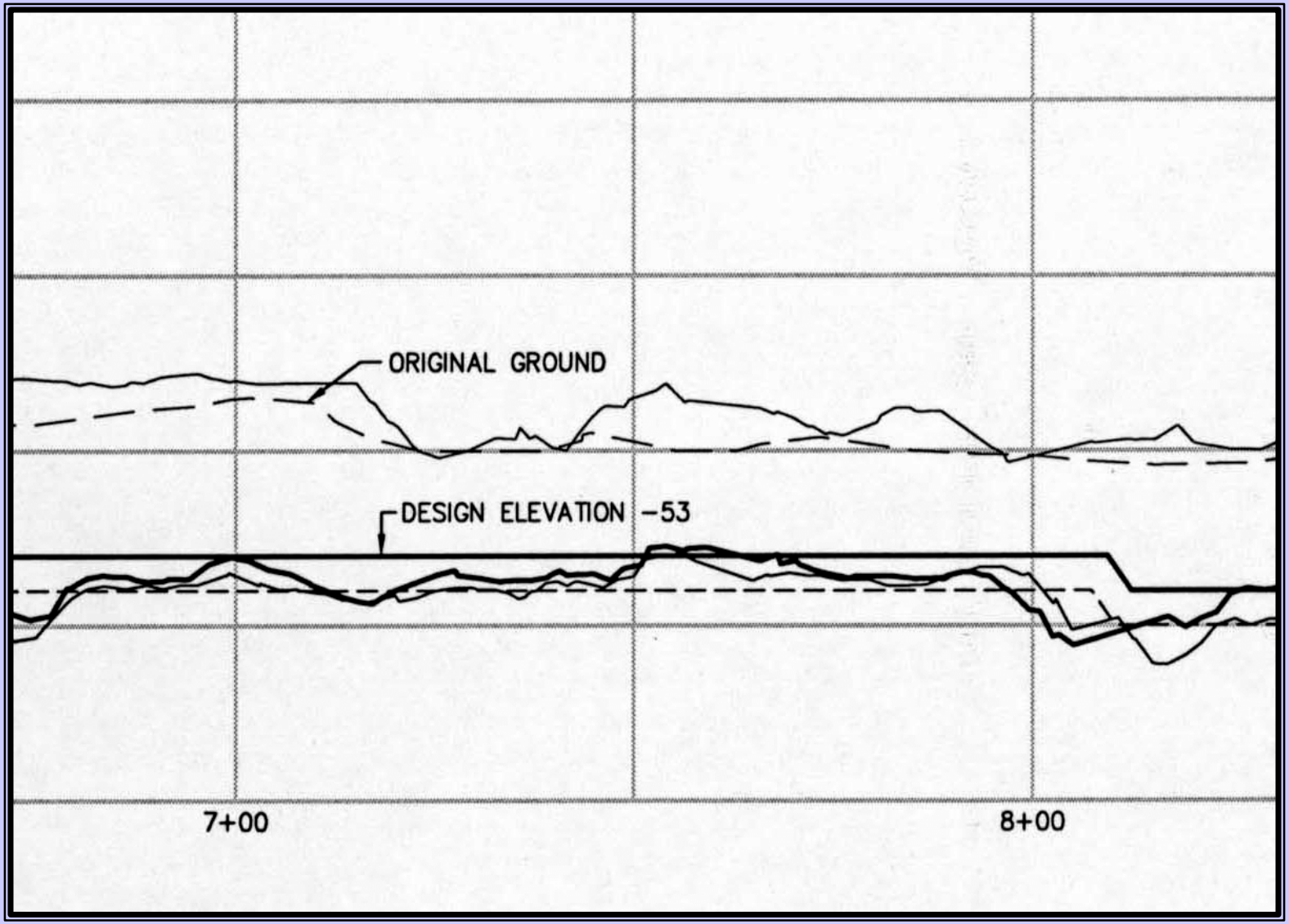


Used Two Types of Buckets

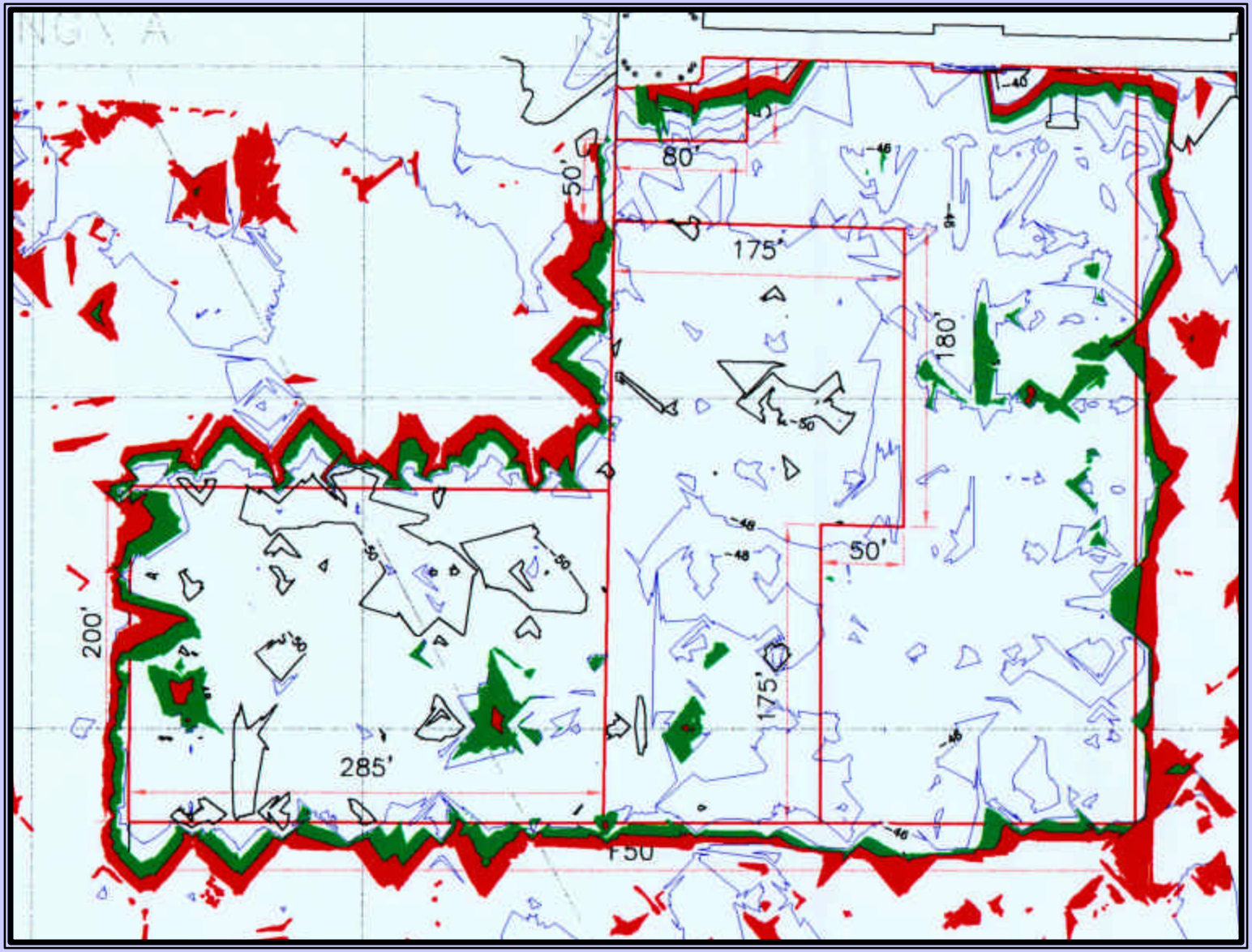
No Difference in Capability or Effective-ness Noted

Subcontractor Liked This Style Better

Successful Results



Post Processing/Reporting



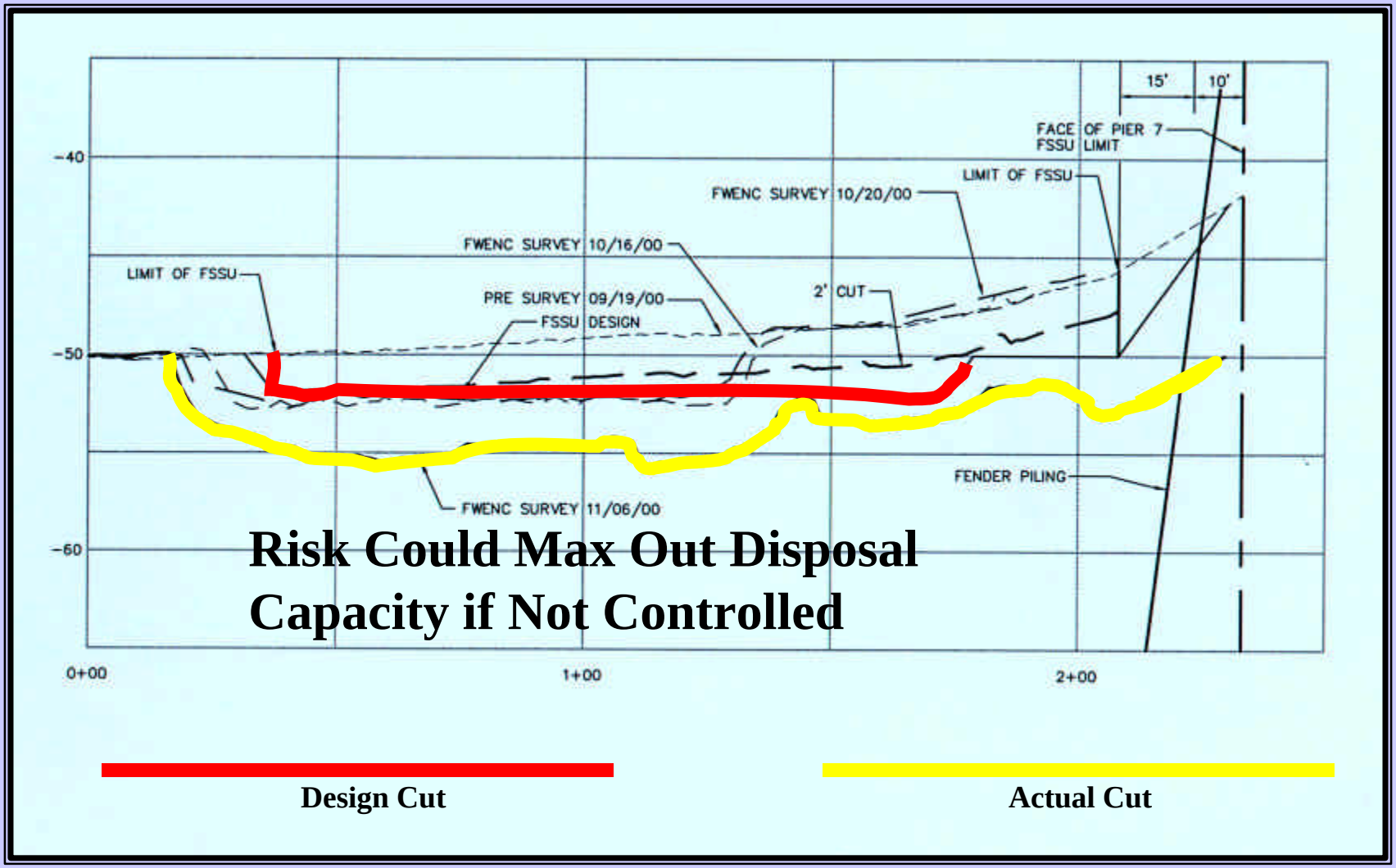
What to Look Out For

- Overfilling Bucket
- Overdredging
- Underdredging

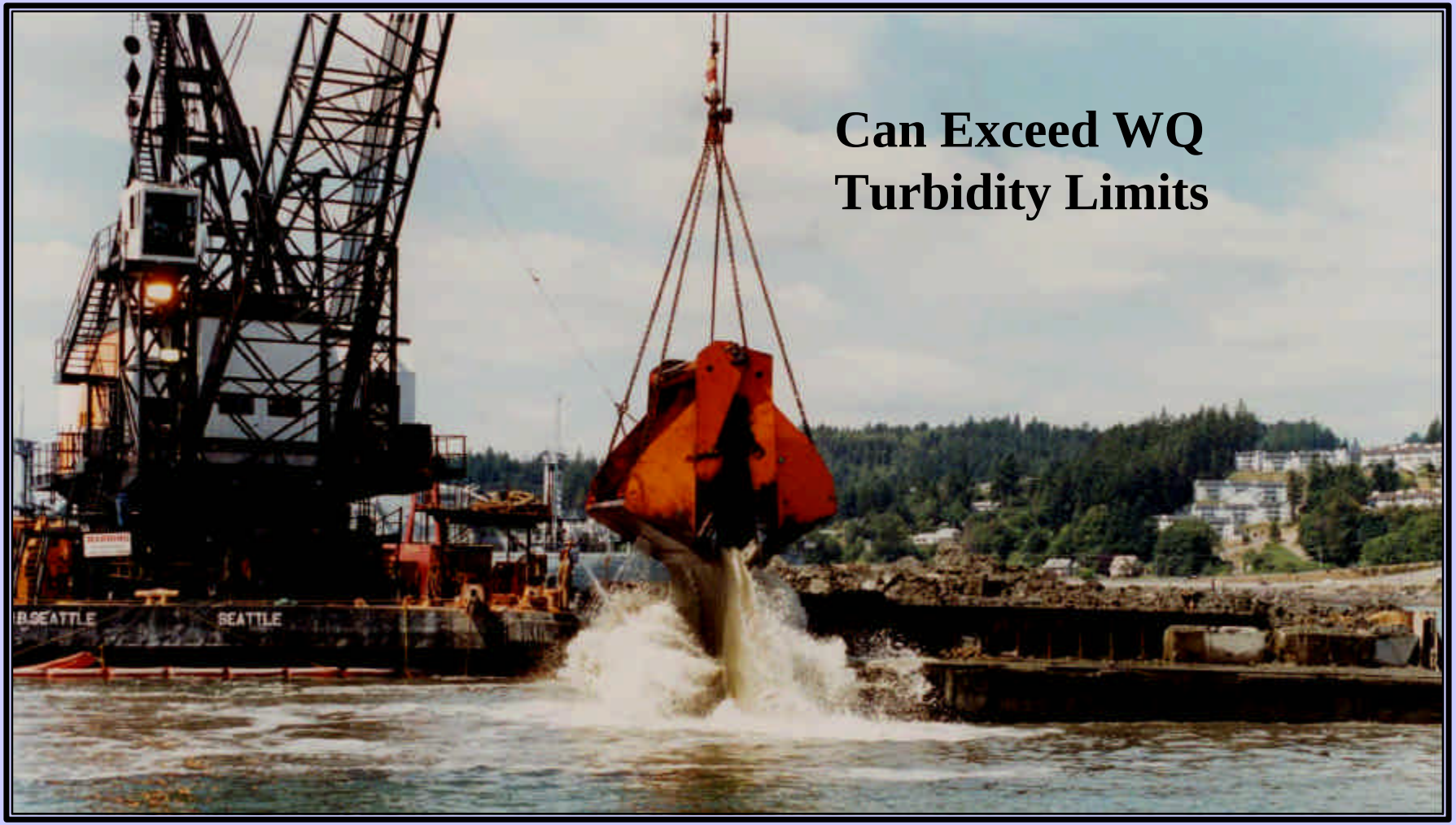
Overfilling = Spills from Vents

Which Can result in
Water Quality Problems

Example of Overexcavation



Prevent Over/Under Filling & Ensure Full Closure



Lessons Learned

- It is Feasible to Successfully Dredge with Large Equipment
- To Do So Must Have an Understanding of the Realities of an Environmental Dredging Project - Owner/Contractor/Regulator
  - Precision of Cuts
  - Water Quality
- Educate Dredger - Include Operators in Process

Lessons Learned (cont)

- Set Realistic Production Rates.
  - Check Bid Unit Prices - Are They Unrealistically Low?
  - Take More Time. Expect to Pay More for Success!
  - These are not “Production” Projects
- Develop and Use an Electronic Vertical Positioning System with a Heads Up Operator Display
- Consider Full Time On Board Construction Oversight

Ward Cove Sediment Remediation

Overview

- 80 Acre Area of Concern
- Relatively Small Dredging Proj (<10,000cy)
- Significant Capping Project (26.4 Acres)
  - Cap of Very Soft Organic Sediments
  - Anticipated a Multi Stage Approach to Capping
- Successfully Implemented at Stage 1 (One Pass Thin Layer Cap)
  - 6 to 9 inch Sand Cap Successfully Placed By Clamshell

Cap Placement

Excellent Coverage Obtained

Lessons Learned

- Possible to Place Uniform Cap on Soft Sediments with Clamshell
- Requires That a Trial and Error Approach be Used
- Success When a Close Owner/Contractor/ Regulator Working Relationship is in Place to Allow Field Modifications to Meet Clean Up Objectives

Co Author and Project Engineer - Everyone Needs a Break!